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SBA-100 OPERATOR

FAMILIARIZATION TRAINING

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SBA-100 OPERATOR
FAMILIARIZATION TRAINING

Introduction

The SBA-100 Operator Familiarization Training is provided to assist SBA-100 users in becoming acquainted with the functional controls, page displays, and basic operational procedures of this instrument.

Prerequisites for this class include an understanding of basic operational theory of electronic bus systems, a basic familiarity with MIL-STD-1553 protocol and specifications, and knowledge of your own particular application requirements.

This class will enbale students meeting the prerequisite requirements to learn, in a single half-day session, how to program and operate the SBA-100 to perform bus monitoring and error detection functions, bus controller and/or remote terminal simulation (both with normal traffic and with intentionally generated errors), noise immunity testing, and pre-programmed automatic testing. Use of the SBA's built-in tape deck, for saving SBA information and set-ups and for down-loading set-up programs, will also be described.

A great deal of information is presented in a relatively short amount of time in this fast-paced program. In order to reduce the amount of note-taking required, this handout provides printouts of every different SBA display page, and descriptions of every variable line on every page. It can also act as a handy reminder guide for SBA operation in the future.

Because of the tremendous capabilities of the SBA-100, a half-day session does not allow complete discussion of all SBA features and operational applications. It is suggested that persons expecting to make extensive use of the SBA arrange to attend one of Loral Instrumentation's three-day SBA Formal Operational Training sessions. These sessions are held on an approximately quarterly basis at Loral's facility in San Diego, California. They can also be performed at a user's facility at any mutually agreeable time, provided at least seven student tuitions, plus instructor's expenses, are paid. Your instructor can provide additional information about these three-day trainings.

If at any time you have questions about SBA use or operation, or wish to inquire about additional training, please contact Vincent Andrunas of Loral Instrumentation at (212) 586-4834.

The OPERATIONAL MODE 1 Page

Page display command: DISPLAY OPER MODE 1

```
                                                    00:08:29
                                                    HEX 1553
                                                     PAGE 00
          OPERATIONAL MODE:
           NORESP (A=10,B=12,C=5,D=17,E=50)US--B
           BROADCAST COMMANDS ----------------NO
           BUS SELECT-------------------------INT
           OUTPUT AMPLITUDE(COUNT)------------128
           XMIT FREQ--------------------------NOR
           ZERO XING DEVIATION(NSEC)----------A,<+150

          FUNCTION DEFINITION:
           FUNCTION---------------------------SAW
           UPPER LIMIT------------------------00256
           LOWER LIMIT------------------------00001
           CYCLE------------------------------001
           STEP-------------------------------001
```

NORESP: Enter option letter (A-E) for maximum response time (dead time) SBA is to accept as a monitor.

BROADCAST COMMANDS: Enter YES or NO to tell SBA whether to allow Broadcast Commands or flag them as NO RESP on monitor pages.

BUS SELECT: Enter INT to simulate bus internal to SBA. If SBA is to connect to an external bus enter DIR or XFM to configure SBA output circuitry to appear as a Direct Coupled or Transformer Coupled device respectively.

OUTPUT AMPLITUDE: Enter a count number (0-255) to vary the amplitude of the SBA's transmissions (as an RT or BC) over the MIL-STD range.

XMIT FREQ: Enter NOR or option A, B, C, or D to set the frequency of the SBA's transmissions to 1Mhz or to either limit of 1553A or B.

ZERO CROSSING DEVIATION: When transmitting a zero-crossing deviation error from an RT or BC page, enter option A, B, C, or D to select direction and magnitude of shift.

FUNCTION: Enter RAND to program Function Buffer for random data, SAW if sawtooth or staircase function is desired.

UPPER LIMIT/LOWER LIMIT: Enter maximum and minimum values of data to appear in Function Buffer (not used with random function).

CYCLE: Enter desired number of sawtooth cycles in Function Buffer (not used with Random function).

STEP: Enter number of consecutive data words from Function Buffer which are to have the same value (set to 001 when the Random function is programmed).

The OPERATIONAL MODE 2 Page

Page display command: DISPLAY OPER MODE 2

```
                                                    00:08:53
                                                    HEX 1553
> DISPLAY OPER MODE 2                                PAGE 01

  RESERVED STATUS BIT--1111111111

  T/R MCODE RSVD*T/R MCODE RSVD*T/R MCODE RSVD*
  ********************************************
    1 00000 NO   *   1 00001 NO   *   1 00010 NO
    1 00011 NO   *   1 00100 NO   *   1 00101 NO
    1 00110 NO   *   1 00111 NO   *   1 01000 NO
    1 01001 YES  *   1 01010 YES  *   1 01011 YES
    1 01100 YES  *   1 01101 YES  *   1 01110 YES
    1 01111 YES  *   1 10000 NO   *   0 10001 NO
    1 10010 NO   *   1 10011 NO   *   0 10100 NO
    0 10101 NO   *   X 10110 YES  *   X 10111 YES
    X 11000 YES  *   X 11001 YES  *   X 11010 YES
    X 11011 YES  *   X 11100 YES  *   X 11101 YES
    X 11110 YES  *   X 11111 YES  *
```

RESERVED STATUS BIT: The ten characters represent the ten bits in the status word between the Message Error bit and the Parity bit. For each bit, enter 1 or Ø. The SBA monitor displays will flag a STABIT error for any status word in which a particular bit matches the entered value. If desired, an X ("don't care") may be entered instead of a 1 or Ø.

MODE CODE Paragraph: Enter YES or NO next to each Mode Code value to designate as Reserved or Non-Reserved, respectively. Monitor display will flag RMODE error for any detected Mode Code designated as Reserved ("YES").

The TERMINAL Page

Page display command: DISPLAY TERMINAL

```
                                                    01:31:54
                                                    HEX 1553
                                                     PAGE 07
>  DISPLAY TERMINAL
   TERM    SUB    WC     BUS CMDS  ERRS   ERRORS
   ***************************************************
   01    R 01     02     PRI 40812 16088  LOWORD*
   ********************************** MEBIT *
   01    R 10     1C     PRI 81622 00000*       *
   12    T 13     09     PRI 61218 00000*       *
   19    R 01     06     PRI 102^3 07452*       *
   1D    T 01     1B     PRI 18195 54591*       *
   1F    T 08     04     PRI 61220 00000*       *
   1F    T 1E     05     PRI 34042 10192*       *
                                      *       *
                                      *       *
                                      *       *
                                      *       *

   TOTAL ERRORS-      1,158,056
```

The Terminal Page displays the contents of the SBA's Background Activity Monitor. It lists all Command words detected on the bus in numerical (not chronological) order by address, subaddress, and wordcount.

PRI, SEC, OR BTH appears in the BUS column, to tell which bus or busses the command has appeared on.

The CMDS column indicates the number of times the Command has been detected. This number changes to scientific notation when 100,000 iterations of a particular command have occured.

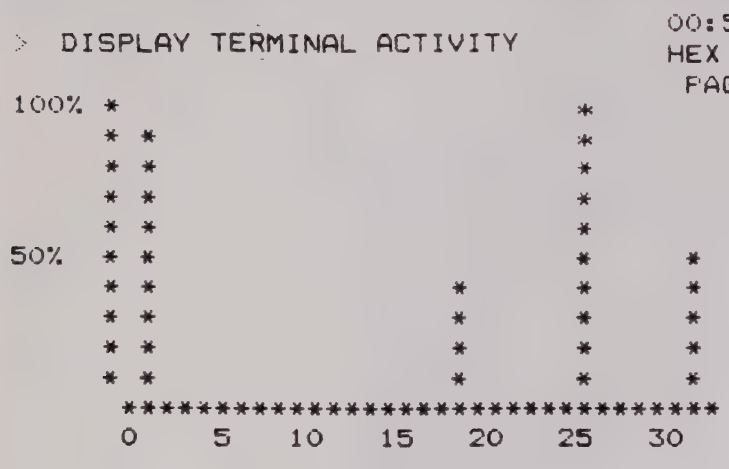
The ERRS column indicates the total number of errors detected in all iterations of the message which began with the Command on that line. Errors in Command, Status, and Data words will be included in this total. When 100,000 errors have been detected, this number will <u>not</u> change to scientific notation, but will reset to 00000 and continue to count upward.

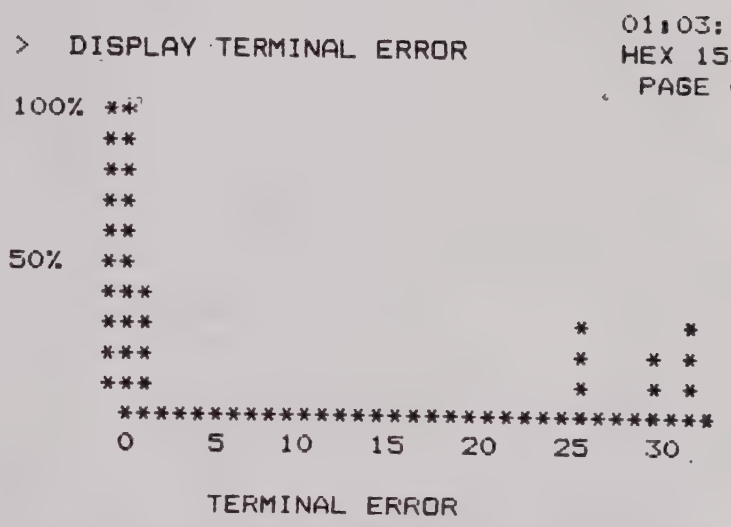
The ERRORS column lists all error types detected for the message beginning with the Command positioned between the horizontal lines at the top of the list. The INCR/DECR keys can be used to scroll any Command to this position.

The TOTAL ERRORS line adds the numbers in the ERRS column for <u>all</u> messages in the monitor's list.

The TERMINAL ACTIVITY and TERMINAL ERROR Pages

Page display commands: DISPLAY TERMINAL ACTIVITY
DISPLAY TERMINAL ERROR





The SBA uses the information from the Terminal Page to produce bar chart displays such as the two shown here. The first is a Terminal Activity bar chart, showing all possible Terminal Address values (in decimal) across the bottom. Bars show relative message activity levels for all addresses. The most often-interrogated address has a bar normalized to 100%. Any other active address will have a bar whose height will show its activity relative to that of the most active address.

A similar bar chart can be generated showing the message activity for all subaddresses within any desired address. To generate such a display, key in the two-digit terminal address (in decimal) before Carriage Return at the end of the display command.

Similarily, Terminal Error bar charts can be generated to show message error activity for all addresses, or for all subaddresses within any desired address.

The STACK Page

Page display command: DISPLAY STACK

```
                                                    01:03:05
*T1                 *FULL                           HEX 1553
>  DISPLAY STACK                                     PAGE 12

   ADDR BUS  ERRORS WN   STACK DATA

    119 PRI          0   C19 R 01 06
    120 PRI          1   D0002
    121 PRI          2   D0009
    122 PRI          3   D001F
    123 PRI          4   D00B2
    124 PRI  PARITY  5   D003E
    125 PRI  NORESP  6   D0071
    126                              156 USEC
    127 PRI          0   C01 R 01 02
    128 PRI  LOWORD  1   D0002
    129 PRI  MEBIT   0   S01 1 00 00
    130                               80 USEC

   START
```

The Stack Page displays a 12-line window into the 2048 line Stack. Line address numbers (1-2048) appear in the ADDR column.

The BUS column indicates whether the word on a given line was detected on the PRImary bus or the SECondary bus.

Errors detected by the SBA are displayed opposite the appropriate word(s) in a column headed ERRORS.

The WN column numbers data words according to their position in the message. Command and Status words are numbered as zeros.

The STACK DATA column shows the actual captured words, labeled as to word type and divided into individual fields. Timing values appear before each Command word, indicating the elapsed time since the beginning of the previous message.

The CAPTURE Page

Page display command: DISPLAY CAPTURE

```
                                                    00:16:45
                                                    HEX 1553
> DISPLAY CAPTURE                                    PAGE 02

  TRIG MODE=START
  TRIG LINK-T1 OR  T2 ARM T3 RST T4

  TRIG ENA BUS  ERROR   VALUE
  T1   YES BTH =        =C01 X XX XX
  T2   NO  PRI =MEBIT   =SXX X XX XX
  T3   NO  SEC =ANYERR  -XXX X XX XX
  T4   NO  BTH -PARITY  =D1234

  CAPT MODE-ALL

  MESG ENA BUS  ERROR   VALUE
  M1   YES BTH =        =C01 X XX XX
  M2   NO  PRI =        =S02 X XX XX
  M3   NO  SEC =BITERR  =DXXXX
  M4   NO  PRI =ANYERR  =RXX X XX XX
```

The Capture page allows the operator to define an occurrence or series of up to four occurrences that the SBA must detect before it triggers and fills the Stack.

The TRIG MODE line instructs the SBA to capture data STARTing with, CENTERed around, or ENDing with the defined trigger set.

The TRIG LINK line forms an equation linking triggers T1 through T4 with linking words like OR, ARM, and RST (restart).

The trigger definition paragraph allows the user to enable one to four triggers, to tell the SBA where to watch for them, and to define the word type, word value, and the error type (if any) associated with the word.

The CAPT MODE line, when set to ONLY directs the SBA to filter information placed into the Stack after satisfaction of the TRIG LINK equation. Only messages that match the enabled message lines (M1-M4) will be used to fill the Stack.

The NOISE TEST Page

Page display command: DISPLAY NOISE TEST

```
                                                    02:23:15
                                                    HEX 1553
> DISPLAY NOISE TEST                                 PAGE 09

                        NOISE TEST

    STATUS:
    TEST---------------------------------- HALT
    TOTAL XMIT WDS------------------- 4,226,368

    ERRORS:
    MEBIT-------------------------------------00
    NORESP------------------------------------00
    TOTAL-------------------------------------00
```

The NOISE TEST page displays the status of a Noise Rejection test being performed on an external RT.

The TEST STATUS line displays EXEC while the test is being executed, PASS if the test has been completed successfully, FAIL if the test has been failed, and HALT if the operator halts the test before completion.

The TOTAL XMIT WORDS line shows how many words were sent to the RT under test.

Under ERRORS, the SBA tabulates detected MEBIT and NORESP errors, and the sum of these two error types.

Page display commands: DISPLAY BC XX (where XX is the BC page number: Ø1-32)

```
                                                    00:00:29
                                                    HEX 1553
> DISPLAY BC 01                                       BC 01

  CMD WORD-------------C01 R 01 00
  GAP TIME--------------------------0010 USEC
  BUS SELECT--------------------------------PRI
  SBA RESPONSE------------------------------YES
  ERROR:
  FUNCTION:
   0000 0000 0000 0000 0000 0000 0000 0000
  DATA:
  0000 --------0000    0001    0002    0003
  0004 --------0004    0005    0006    0007
  0008 --------0008    0009    000A    000B
  0012 --------000C    000D    000E    000F
  0016 --------0010    0011    0012    0013
  0020 --------0014    0015    0016    0017
  0024 --------0018    0019    001A    001B
  0028 --------001C    001D    001E    001F
```

CMD WORD: Enter the Command Word desired for the start of the Bus Controller message being programmed on this page.

GAP TIME: Enter the desired Inter-message Gap time.

BUS SELECT: Enter PRI or SEC to determine on which bus the message will be transmitted.

SBA RESPONSE: Enter YES if the SBA will simulate an RT responding to this message; NO if an external RT will reply (determines application of value on GAP TIME line).

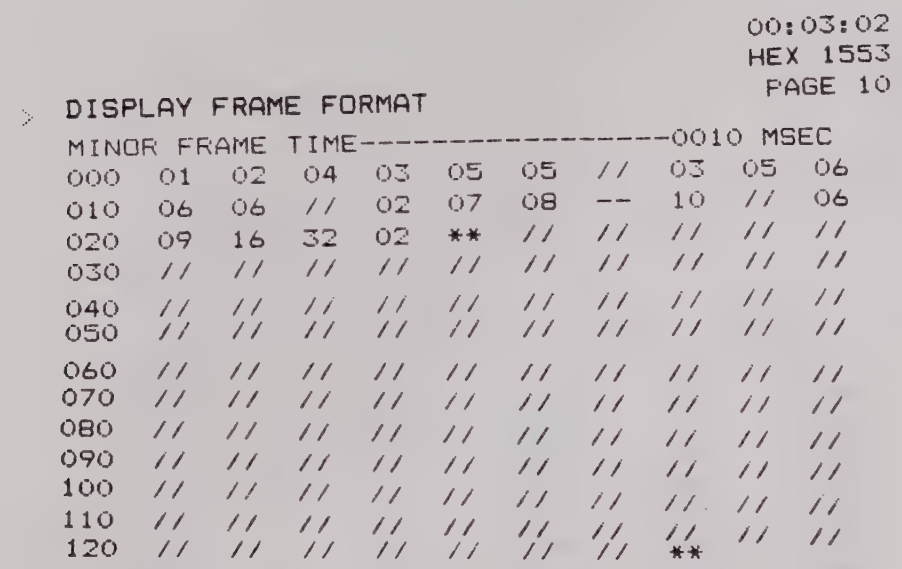
ERROR: Enter error type, if an error is desired in this BC message.

FUNCTION: Determines source of each of the 32 possible data words that could be transmitted with this message (1 = Function Buffer, Ø = 7ØØ Word Data Buffer).

DATA: Displays data to be transmitted with this BC message.

The FRAME FORMAT Page

Page display command: DISPLAY FRAME FORMAT



The Frame Format page is used to program the sequence of BC pages in the desired order for transmission, and to divide the series of BC pages into minor frames. All the minor frames together form a major frame.

The two-digit numbers represent BC page numbers (01-32). The // symbol marks the end of a minor frame. All minor frames will have the same duration, as specified on the MINOR FRAME TIME line (1 to 9999ms). The ** symbol marks the end of the major frame.

Except for the MINOR FRAME TIME line, all changes to the Frame Format page are made on the Command Line with a CHANGE FRAME command. Each of the 128 slots on the Frame Format page has a slot number, or address (000 to 127). The three-digit numbers in the left-hand column are the slot numbers for the first column of slots.

Page display command: DISPLAY RT XX (where XX is the RT page number: 01-32)

```
                                                    00:06:55
                                                    HEX 1553
> DISPLAY RT 01                                       RT 01

  ENAB-----------------------------------YES
  RESP BUS-------------------------------NOR
  RESP CMD-------------C06 T XX XX
  STATUS WORD----------S06 0 00 00
  ERROR:
  FUNCTION:
   0000 0000 0000 0000 0000 0000 0000 0000
  DATA:
  0153 --------0099    009A    009B    009C
  0157 --------009D    009E    009F    00A0
  0161 --------00A1    00A2    00A3    00A4
  0165 --------00A5    00A6    00A7    00A8
  0169 --------00A9    00AA    00AB    00AC
  0173 --------00AD    00AE    00AF    00B0
  0177 --------00B1    00B2    00B3    00B4
  0181 --------00B5    00B6    00B7    00B8
```

ENAB: Enter YES to activate page, NO to inactivate.

RESP BUS: Entering NOR causes the simulated RT to respond on the bus on which the Command was received, while INV causes the response to occur on the opposite bus. PRI and SEC make the response occur always on the indicated bus.

RESP CMD: Enter the Command to which this RT page is to respond. Address and T/R bit must be specified. XX may be entered subaddress and/or wordcount fields, if responses to various Commands are required from this RT page.

STATUS WORD: Enter the values for the Status word to be transmitted in response to the Command word defined above.

ERROR/FUNCTION/DATA: Same as described for BC pages.

The I/O SETUP Page

Page display command: DISPLAY I/O SETUP

```
                                                    01:08:18
                                                    HEX 1553
> DISPLAY I/O SETUP                                  PAGE 05

   SERIAL INTERFACE:

    BAUD RATE----------------------------0
    DATA BITS----------------------------8
    STOP BITS (A=1,B=1.5)----------------B
    PARITY ENABLE------------------------NO
    PARITY-------------------------------ODD
    BAUD SEL: 0=9600 1=110 2=150 3=300
              4=600 5=1200 6=2400 7=4800

    GPIB INTERFACE:

    TERM ADDRESS------------------------ 30
```

The I/O Setup page allows the user to program the SBA's serial RS-232 and parallel GPIB interfaces. These interfaces allow the SBA to connect to a host compuer and be operated by and/or transfer data to and from that host device. They also enable connection of the SBA to an RS-232-type printer.

To accommodate the various versions of RS-232 interface, the SBA allows control of the Baud Rate, number of Data Bits, Stop Bit, length, and Parity scheme.

For GPIB interface, the I/O page allows control of the SBA's Terminal Address.

The KEYRECORD Pages

Page display command: DISPLAY KEYRECORD XXX (where XXX is the keyrecord page number: 1-254)

```
                                                    00:04:50
                                                    HEX 1553
                                                     KEY 218
> DISPLAY KEYRECORD 218

  DISPLAY OPER MODE 1
  DISPLAY BC 01
  DISPLAY RT 01
  XMIT FOREVER
  RUN STACK
  WAIT STACK FULL
  DISPLAY STACK 1
  KEY
  DISPLAY TERMINAL
  WAIT 2000
  EXECUTE KEYRECORD 199
```

The SBA's 254 keyrecord pages may be used separately or joined together to form keyrecord sequences of any length.

Keyrecord pages are programmed with the same commands, entered with the same keystrokes as when operating the SBA in real time. Once written, a simple EXECUTE KEYRECORD XXX command can be used to initiate execution of a keyrecord of any length. Subroutines, loops, tests, and conditional branches can be written into keyrecord programs to form very powerful test routines.

MP MASTER
MA31294